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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/812,515	03/20/2001	Ryoichi Mukai	2500.65302	2232

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EXAMINER	
UHLIR, NIKOLAS J	
ART UNIT	PAPER NUMBER
1773	5

DATE MAILED: 11/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/812,515	MUKAI ET AL.	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *7-12, 14-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-6 and 13 in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the claims share many common features and thus would not put undue burden on the examiner as the search for both sets of claims would likely overlap. This is not found persuasive because claims 1-6 and 13 are directed towards a product, namely a layered polycrystalline structure or a magnetic recording media. Claims 7-12 and 14-20 are method claims which require significant method steps that would not be searched in the same class as the product claims, as evidenced by the classification of method claims 7-12 and 14-20 in class 427 subclass 130, whereas the product claims are classified in class 428 subclass 694TS.

The requirement is still deemed proper and is therefore made FINAL.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the instant case, claims 1, 2 and 4 recite the limitation, "diffusing along a grain boundary." It is unclear to the examiner whether the

applicant intends this to be a process step, in which a non-magnetic element is "in the process" of diffusing across the grain boundary, or whether the applicant intends this limitation to be a structural limitation, requiring the individual grains in a magnetic layer to have a non-magnetic element present in the grain boundary between grains. Clarification is required.

5. The term "sparsely" in claim 13 is a relative term which renders the claim indefinite. The term "sparsely" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Clarification is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bertero et al. (US6150015) in view of Bian et al. (US6143388).

8. For the purpose of this examination, the examiner has interpreted the limitation "diffusing along a grain boundary" in claims 1-6 to mean that the magnetic crystal layer comprises grains and a non-magnetic element separating the grains along the grain boundaries present in the film. This interpretation is supported by the specification, by the sentence bridging pages 14 and 15.

9. Regarding claim 1, wherein the applicant requires a layered polycrystalline structure comprising a seed layer containing a non-magnetic element at a first concentration level; a magnetic crystal layer containing non-magnetic element diffusing along a grain boundary; and a non-magnetic crystal layer interposed between the seed layer and the magnetic layer, said non-magnetic crystal containing a non-magnetic element at a second concentration level smaller than the first concentration level. Bertero et al. teaches a magnetic recording medium comprising a substrate, a Cr or Cr alloy underlayer (equivalent to applicants seed layer) on the substrate, an ultra-thin nucleation layer on the Cr or Cr alloy underlayer, and a CoCrPt based magnetic alloy layer on the ultra-thin nucleation layer (column 11, lines 45-55).

10. Regarding the requirement in claim 1 of a non-magnetic seedlayer, it is the examiners position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to select Cr as the underlayer on the substrate of Bertero et al., as Bertero et al. teaches the equivalence of Cr to an alloy of Cr as a suitable material for the underlayer. Because Cr is a known non-magnetic element, the examiner takes the position that when a Cr underlayer is utilized the underlayer is nonmagnetic, thus meeting this limitation.

11. Regarding the limitation in claim 1 requiring the magnetic layer to have a non-magnetic element diffused along a grain boundary. Bertero et al. teaches that the magnetic layer comprises a CoCrPt alloy that has grains which are isolated from one another by a solid segregant such as excess Cr in the CoCrPt alloy (column 14, lines 1-5). The examiner takes the position that isolation of grains by a solid segregant such as

Cr is equivalent to having a non-magnetic element diffuse along the grain boundaries of a magnetic layer. Thus, this limitation is met.

12. Although Bertero does teach the use of CoCr as a suitable material for the ultra-thin nucleation layer (column 11, lines 45-55) Bertero et al. does not teach that this layer is non-magnetic, as required by claim 1.

13. However, with respect to this limitation, Bian et al. teaches a magnetic recording medium that is similar in structure to the material described by Bertero et al. The Bian et al. recording medium comprises a substrate, a seed layer, an underlayer, an onset layer (analogous to Bertero et al.'s nucleation layer), a magnetic layer, and an overcoat (figure 2, and column 3, lines 5+). The underlayer is typically Cr or a Cr alloy and is non-magnetic (column 3, lines 29-37). The onset layer can comprise CoCr, and can serve its function of promoting the growth of a magnetic layer having a specific crystal structure whether it is magnetic (Cr<30 at. %) or non magnetic (Cr>30 at. %) (column 4, lines 15-25).

14. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to select non-magnetic CoCr as taught by Bian et al. as the ultra-thin nucleation layer used in Bertero et al.

15. One would have been motivated to make such a modification due to the teaching in Bian et al. that non-magnetic or magnetic CoCr is equivalent for use as an onset (nucleation) layer in a multilayer magnetic recording medium. One would have further been motivated to make this modification due to the fact that the onset layer in Bian et al. and the Nucleation layer in Bertero et al. are formed **n** the same type of material (i.e

Cr or Cr alloy) and are both used to control the crystal structure of a magnetic layer formed on the surface of the nucleation/onset layer.

16. Regarding the limitations of claim 2, wherein the applicant requires a seed crystal layer containing ≥50 at. % Cr, a Co based alloy magnetic crystal layer containing Cr atoms diffusing along the grain boundaries, and a Co based non-magnetic crystal layer disposed between the seed layer and the magnetic layer, wherein the Co based non-magnetic crystal layer contains less Cr than the seed layer. These limitations are met as set forth above for claim 1, specifically when a pure Cr layer is used as the underlayer in Bertero et al.

17. Regarding the limitations of claim 3, wherein the applicant requires the seed crystal layer to be pure Cr. This limitation is met as set forth above for claim 2.

18. Regarding the limitations of claim 4, wherein the applicant requires a magnetic recording medium comprising a substrate, a seed crystal layer formed on a surface of the substrate and containing a non-magnetic element at a first concentration level; a magnetic crystal layer containing a non-magnetic element diffusing along a grain boundary; and a non-magnetic crystal layer interposed between the seed layer and the magnetic layer, wherein the non-magnetic crystal layer contains a non-magnetic element at a second concentration level smaller than the first concentration level. These limitations are met as set forth above for claim 1.

19. Regarding the limitations of claim 13, wherein the applicant requires a layered polycrystalline structure comprising nucleation sites sparsely existing on over a surface of a substrate; and a crystal layer covering the surface of the substrate and containing

crystal grains growing from the nucleation sites. Bertero et al. teaches that the magentic layer grains grow epitaxially over the nucleation layer grains, thus meeting the limitation in claim 13 requiring a crystal layer covering the surface of the substrate and containing crystal grains growing from the nucleation sites. It should be noted that the claim language "sparsely existing over a surface of a substrate" is open language and does not necessarily require the nucleation sites to be formed "directly on the substrate" or "directly in contact with the substrate." In addition, although neither Bertero et al. nor Bian et al. teaches that the nucleation sites are "sparsely" dispersed on the surface of the substrate, Bertero et al. does teach that controlling the size of each nucleation site and the spacing between adjacent nucleation sites provides an easy means for controlling the grain growth characteristics, size and spacing of the magnetic recording layer, provides large angle grain boundaries, and provides a method for optimizing the segregant material such as Cr at the grain boundaries in the magnetic layer (column 14, lines 15-28).

20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to change the distance between nucleation sites in the ultrathin nucleation layer of Bertero et al. for the reasons given above.

21. The examiner acknowledges that Bertero et al. teaches that the ultra thin nucleation layer should preferably be close to the same composition as the magnetic layer, for the purpose of lattice matching the nucleation layer to the magnetic layer. However Bian et al. teaches that lattice matching between the onset layer and the magnetic layer can be achieved utilizing a non-magnetic film of CoCr that incorporates

additional elements such as Pt, B, and Ta can be used to lattice match the onset layer to a magnetic layer. As Bertero et al. is concerned with lattice matching the nucleation layer to the magnetic layer, and Bian et al. teaches a composition for achieving that exact same goal, the combination of Bian et al. with Bertero et al. does not destroy the Bertero et al. reference.

22. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bertero et al. as modified by Bian et al. as applied to claim 1 above, and further in view of Okumura et al. (US5700593).

23. Bertero et al. as modified by Bian et al. does not teach an amorphous layer defined along the surface of the substrate, as required by claim 5. Further, Bertero et al. as modified by Bian et al. does not teach a Ti layer defined along the surface of the substrate, as required by claim 6.

24. However, with respect to these limitations, Okumura et al. teaches that the crystal grains of a magnetic recording medium can be refined by forming a non-magnetic amorphous metal layer on the surface of a substrate prior to the deposition of any other non-magnetic or magnetic layers (column 2, lines 38-65). Suitable materials for forming the non-magnetic amorphous layer include pure Cr, pure V, pure Ti, or a Cr, V, or Ti alloy having an alloy composition providing an amorphous structure (column 4, lines 15-20).

25. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a non-magnetic amorphous Ti layer as taught by

Okumura et al. between the substrate and the first non-magnetic layer in Bertero et al. as modified by Bian et al.

26. One would have been motivated to make this modification due to the teaching in Okumura et al. that the grain size of a magnetic recording medium can be improved through the deposition of a non-=magnetic amorphous layer on the surface of a substrate prior to the deposition of other magnetic or non-magnetic layers. One would have specifically been motivated to choose Ti as the non-magnetic amorphous material due to the teaching of the equivalence of Ti to the other materials listed as suitable for use as the amorphous non-magnetic crystal layer by Okumura et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

nju
October 14, 2002

STEVAN A. RESAN
PRIMARY EXAMINER